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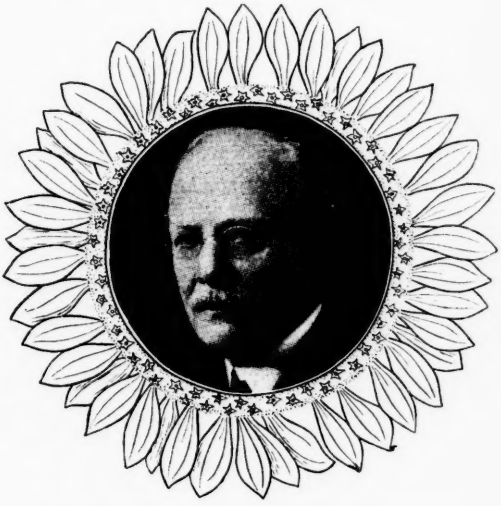

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DISTRIBUTIONAL NOTES ON UTAH COLEOPTERA: PART II

GEORGE F. KNOWLTON.

(Concluded from Vol. 9, No. 3.)

P. semiruber Horn. Blue Creek, August 29, 1931; Lampo, April 24, 1933.

P. occidentalis Horn. Manti, August 31, 1933; Providence (Hammond).

Staphylinus nigrellus Horn. Logan, October 17, 1930 (Thomas).

Ocypus ater (Grav.). Providence, August 5, 1930.

Ontholestes cingulatus (Grav.). Strawberry, August 14, 1933 (Anthon).

Creophilus maxillosus (L.). Antelope Island, April 23, 1933 (Knowlton:: Cutler); Brigham, June 25, 1927; Clearfield; Fairfield; Fruitland; Locomotive Springs (Anthon); Logan (Thatcher); Ogden; Strawberry (Anthon).

Quedius brunneipennis Mann. Logan.

Q. mesomelinus (Marsh.). Logan, May 1, 1931

Megaquedius explanatus (Lec.). Logan, October 6, 1911; Strawberry (Anthon).

Tachinus angustatus Horn. Benson, February 26, 1908 (Titus).

Family **Rhipiphoridae**

Rhipiphorus cruentus Germ. Logan, July 24, 1935 (R. E. Nye).

Family **Elateridae**

The writer is indebted to Mr. M. C. Lane for the identification of the Elateridae material here recorded.

Aeolus dorsalis (Say.). Bothwell, June 18, 1929; Benson; Cache Junction (Titus); Fort Duchesne (Stoffers); Garland; Lampo; LaPoint (C. J. Sorenson); Logan; Logan Canyon; Naples; Provo; Salt Lake City.

Athous nigripilis Mots. Salt Lake City, August 26, 1929; Strawberry (Anthon).

Limonius californicus Mann. Blacksmith Fork Can-

yon, May 12, 1931; Hayden (Stoffers); Honeyville (Thomas); La Point (Stoffers); Taylor.

L. infuscatus Mots. Kaysville, May 11, 1931; on **Artemisia tridentata** at Logan, April 14, 1933.

Ludius volitans (Esch.). Logan Canyon, April 29, 1934 (Thatcher).

L. umbricola (Esch.). Logan, July 17, 1933 (Linford).

L. triundulatus (Rand.). Monticello, June 18, 1933.

L. fallax (Say). Logan, April 15, 1931 (Thomas); Logan Canyon (Thatcher).

L. leucaspis (Germ.). Logan, June 16, 1931 (Thomas); Logan Canyon.

L. conjungens (Lec.). Blacksmith Fork Canyon, May 12, 1934.

L. rotundicollis (Say). Logan Canyon, September 30, 1934 (Thatcher).

L. hieroglyphicus (Say). Logan Canyon, June 10, 1934 (Thatcher); Palmer Lake (Thatcher).

L. aeripennis Kby. Logan, May 17, 1933; Logan Canyon; Palmer Lake.

Hemicrepidus carbonatus Lec. Fort Duchesne, July 14, 1932; Logan (B. G. Whitaker); Providence (Hammond).

Glyphonyx quadraticollis Champ. St. George, July 9, 1934 (Knowlton:: C. F. Smith)

Elater behaensi Horn. Logan, June 11, 1935 (Thatcher).

E. phoenicopterus Germ. Logan Canyon, October 20, 1934 (Thatcher).

E. bimaculatus Van D. Logan, May 11, 1933 (Whitaker).

Anchastus cinereipennis (Esch.). Ft. Duchesne, June 15, 1932 (Cutler); Howell.

Melanotus texanus Cand. Logan, May 25, 1932 (Thatcher); Strawberry, September 30, 1933 (Anthon).

M. oregonensis (Lec.). Logan, June 20, 1931 (Thomas); Logan Canyon. (Thatcher); Penrose.

Cardiophorus amplicollis Mots. Logan, April 20, 1907 (Titus).

C. crinitus Bl. Logan Canyon, April 29, 1934 (Thatcher).

C. longior Lec. Logan Green Canyon, April 22, 1934 (Thatcher).

Family **Dermestidae**

Dermestes marmoratus Say. Antelope Island, April 23, 1932 (Knowlton:: Cutler); Locomotive Springs (Anthon); Logan (Thomas); Snowville; Newton, October 7, 1926 (F. L. Clark).

D. caninus Germ. Ft. Duchesne, August 13, 1932 (Cutler); Logan; Providence.

D. caninus var. compactuus Csy. Ft. Duchesne, July 9, 1932 (Stoffers); Stansbury Island, June 13, 1913 (Pack: Titus).

D. fascitus Lec. Fruitland, May 29, 1933.

D. talpinus Mann. Logan, May 29, 1933 (Thatcher); Strawberry (Anthon).

D. lardarius L. Corinne, April 20, 1931; Logan; Providence (Hammond).

Anthrenus acomanus Csy. Santa Clara and St. George, April 26, 1935 (Knowlton: C. F. Smith).

COLEOPTERA OF AN ORIGINAL PRAIRIE AREA IN EASTERN NEBRASKA

DON B. WHELAN, University of Nebraska

The paper is a part of an ecological study of a tract of original prairie that was described by Steiger[1] (1930). It is located about nine miles northwest of Lincoln and consists of about three hundred and twenty acres of both low prairie and upland prairie vegetation. In describing it Steiger says: "The low prairie is characterized by a continuous, dense sod, predominantly composed of big bluestem **(Andropogon furcatus)**, and the upland prairie by more open ground and a varied pattern of little bluestem **(Andropogon scoparius)**, needle grass **(Stipa spartea)**, June grass **(Koelaria cristata)**, dropseeds **(Sporobolus)**, grama grass **(Bouteloua)**, and a profuse growth of non-grassy subdominants. In the ravines are found such shrubs as **Toxicodendron radicans, Rhus glabra, Prunus americana, Cornus stolonifera, Sambucus canadensis, Salix interior** and **Symphoricarpos occidentalis.** The trees are mostly boxelder, western cottonwood and several species of willow."

1 Steiger, T. L. Structure of Prairie Vegetation. Ecology 9(1) 170-217. 1930.

2. Leng, Charles W. Catalogue of the Coleoptera of America, north of Mexico. John D. Sherman Jr., Mount Vernon, N. Y., 1920.

Procedure

In collecting coleoptera the insect net was used for the most part, fifty sweeps being used as a unit of sampling. Examinations were made in all parts of the prairie at intervals of one week or less during the growing season. In the late fall, winter and early spring examinations were made under stones, grass and pieces of litter. On two different occasions an auto headlight was used to attract insects after dark, care being taken that it was not directly seen from outside the limits of the prairie.

Acknowledgements

The Curculionidae were identified by Dr. L. L. Buchanan and the other species by Mr. Charles Schaeffer and by the author.

Annotated List

The following list of species is arranged according to Leng2: The insects captured on the high prairie have an H. following their name, those taken on the low prairie are followed by an L. and the insects of the ravines by an R.

Cicindelidae

Cicindela punctulata Oliv. L. on grass, July 12, 1929.

Carabidae

Pasimachus elongatus Lec. L. on ground, May 23, 1928; H. under stone, April 23, 1930.

Bembidion texanum Chd. at light, May 27, 1930.

Evarthrus orbatus (Newn.) L. on ground, July 10, 1929.

Lebia atriventris Say L. on grass, May 27, 1930; at light, night of May 27, 1930.

Calleida decora (Fab.) R. on grass and shrubs, September 6, 1928.

Calleida purpurea (Say) R. on grass and shrubs, September 6, 1928.

Agonoderus comma (Fab.) at light, September 8, 1928.

Lycidae

Calopteron terminale (Say) L. on grass, August 28, 1928; R. on grass September 8, 1928.

Cantharidae

Chauliognathus pennsylvanicus DeG. L. on grass, August 16 to September 3,1928; on **Solidago glaberrima, S. rigida** and **Helianthus annuus,** August 16 to September 27, 1928. Very common late summer and fall.

Cantharis tuberculatus Lec. L. on a prairie flower, May 23, 1929.

Cantharis bilineatus Say L. on grass, May 16, 1928; on wild gooseberry, May 2, 1929.

Cleridae

Hydnocera humeralis Say H. on grass, May 17, and 24, 1928; L. on grass, July 17, 1929.

Mordellidae

Mordella melaena Germ. L. on grass, July 10, 1929.

Meloidae

Pyrota engelmanni (Lec.) H. on grass, June 1, 1928; at light, May 27, 1930.

Epicauta trichus (Pallas) L. and H. on grass, July 12 and 19, 1928.

Epicauta ferruginea (Say) L. on grass, July 19, 1928; on **Solidago glaberrima**, September 3, to 18, 1929.

Epicauta maculata (Say) H. on grass, July 10 and 12, 1928; L. on grass, July 19, 1928.

Epicauta cinerea (Forst.) H. on grass, July 10, 1928; L. on grass, August 28, 1928.

Epicauta pennsylvanica (DeG.) L. on **Solidago glaberrima** and **Helianthus annuus** August 2 to September 27, 1928.

Macrobasis unicolor (Kby.) L. on grass, May 24 to June 12, 1928.

Macrobasis segmentata (Say) L. on grass, July 12, 1928; at light, May 27, 1930.

Elateridae

Drasterius elegans (Fab.) H. on grass, August 10, 1928; at light, May 27, 1930.

Phalacridae

Thalacrus politus (Say) L. on grass, October 25, 1928.

Coccinellidae

Ceratomegilla maculata DeG. H. on grass, June 1, 1928.

Hippodamia tredecim-punctata (B.) on grass and shrubs, August 30, 1928.

Hippodamia parenthesis (Say) L. on grass, May 12, 1928; under stone, October 25, 1928 and March 14, 1929.

Hippodamia convergens Guer. L. on grass, May 12 to October 3, 1928; March 21 to May 17, 1929; under stone, October 25, 1928 and March 14, 1929.

Hippodamia glacialis (Fab.) L. on grass, May 16, 1929.

Coccinella novemnotata Hbst. H. on grass, July 10, 1928; on wild gooseberry, April 23, 1928.

Cycloneda sanguinea (L) R. on grass and shrubs, October 3, 1928.

Tenebrionidae

Eleodes tricostata (Say) H. on ground, August 2, 1928; L. on ground, August 28, 1928.

Eleodes suturalis (Say) H. under stone, May 9, 1929.

Scarabeidae

Canthon laevis (Drury) L. flying around close to ground, May 17, 1928.

Copris tullius Oliv. at light, May 27, 1930.

Aphodius brevicollis Lec. L. flying around near ground, April 24, 1929.

Aphodius concavus Say H. under stone, April 23, 1930; at light, May 27, 1930.

Aphodius inquinatus (Mull.) L. flying around near ground, March 21, 1929.

Eucanthus lazarus (Fab.) at light, May 27, 1930.

Diplotaxis frondicola (Say) L. on grass at dusk, May 27, 1930.

Phyllophaga lanceolata (Say) H. on grass, July 10, 1928.

Phyllophaga praetermissa Horn. at light, May 27, 1930.

Phyllophaga tristis (Fab.) H. in ground, May 2, 1930.

Pachystethus lucicola (Fab.) L. on grass, July 10, 1929.

Ligyrodes relictus (Say) L. in ground, May 2, 1930; at light, May 27, 1930.

Euphoria inda (L.) L. in grass, March 21, 1929; R. flying around, April 12, 1928; on **Helianthus annuus** and **Solidago glaberrima**, September 3 and 10, 1930.

Cremastocheilus knochi Lec. L. on pocket gopher mound, April 23, 1930.

Cerambycidae

Typocerus zebra (Oliv.) L. on grass, July 12, 1928.

Typocerus velutina (Oliv.) L on grass, July 12, 1928.

Typocerus sinuata (Newn.) L. on grass, July 12, 1928.

Cyllene decora (Oliv.) L. on Solidago rigida, September 10, 1928.

Chrysomelidae

Lema trilineata (Oliv.) R. on grass and shrubs, September 6, 1928 and July 10, 1929.

Pachybrachys pubescens (Oliv.) L. on grass, May 16, 1929.

Pachybrachys othonus (Say) L. on grass, July 10 and 18, 1928.

Pachybrachys litigosus Suffr. L. on grass, July 10 and 18, 1928.

Pachybrachys autocylus Fall L. on grass, June 1 and July 19, 1928.

Pachybrachys luridus (Fab.) L. on grass, July 10, 1929.

Cryptocephalus quadruplex Newn. R. on **Rumex** sp., July 8, 1928.

Cryptocephalus venustus Fab. R. on grass, July 19, 1928.

Grahops curtipennis (Melsh.) L. on grass, May 16, 1928.

Paria canella aterrima (Oliv.) R. on grass and shrubs, July 10, 1929.

Leptinotarsa decemlineata (Say) H. on grass, August 16 and 20, 1928 and July 10, 1929.

Gastroidea cyanea Melsh. R. on weeds, April 18 and May 3, 1929.

Trirhabda tomentosa (L.) H. on grass, August 28 to September 18, 1928; July 10 to August 8, 1929.

Trirhabda canadensis (Kby.) H. & L. on grass, July 5 to September 13, 1928; R. on grass and weeds, August 9 and 16, 1928 and July 10 to August 1, 1929.

Galerucella americana (Fab.) H. on grass, May 24 to September 6, 1928; and August 20, 1929.

Galerucella nymphae (L.) L. on grass, May 17 to August 16, 1928; August 15 to October 3, 1929; under stone, March 14, 1929.

Galerucella tuberculata (Say) H. on grass, August 28 to September 8, 1928; R. on grass, August 16 to September 27, 1928; L. on grass, July 5 to August 28, 1928, July 10 to August 29, 1929.

Galerucella decora (Say) R. on shrubs, June 8, 1928.

Diabrotica duodecempunctata (Fab.) R. on grass and shrubs, August 10 to October 3, 1928; on thistle, September 3, 1929.

Diabrotica longicornis (Say) R. on grass, August 10 to October 3, 1928; on thistle, September 3, 1929.

Diabrotica fossata Lec. R. on grass and shrubs, July 10 and 18, 1929.

Blepharida rhois (Forst.) R. on Solidago rigida, Rhus glabra, grass and shrubs, June 8 to October 3, 1928.

Oedionychis thymoides Cr. L. on grass, May 24 and June 1, 1928.

Disonycha carolina (Fab.) R. on grass, August 2 to 28, 1928; L. on grass, September 10, 1928; on weed, April 18, 1929.

Disonycha triangularis (Say) H. on grass, May 12, 1928.

Disonycha xanthomelaena (Dalm.) R. on grass, August 9, 1928.

Haltica lazulina Lec. H. on grass, August 30, 1928.

Microrhopala vittata (Fab.) L. on grass, July 10, 1929.

Chelymorpha cassidea (Fab.) R. on grass and shrubs, July 12 to 26, 1928.

Physonota unipuncta (Say) R. on grass and shrubs, May 17 to August 9, 1928.

Jonthonota nigripes (Oliv.) L. on grass, July 10, 1929.

Curculionidae

Auletes sp. L. on grass, August 2, 1928.

Rhynchites bicolor Fab. R. on wild rose, **Rose pratincola**, June 8, 1928.

Attelabrus nigripes Lec. R. on grass and **Rhus glabra**, June 8 to October 10, 1928.

Apion obsoletum Sm. L. on grass, August 19, 1928.

Apion punctinasum Sm. R. on grass, July 26, 1928.

Apion oblitum Sm. L. on grass, May 17, 1928; H. on grass, May 17 to July 12, 1928.

Apion extensum Sm. R. on grass and shrubs, August 9, 1928.

Apion parallelum Sm. R. on grass and shrubs, May 24 to October 10, 1928.

Epicaerus imbricatus Say L. on grass, July 12 to September 13, 1928

Desmoris constrictus (Say) R. on grass, September 6, 1928.

Desmoris fulvus (Lec.) R. on Helianthus annuus, September 3, 1928.

Lixus terminalis Lec. R. on wild strawberry, June 8, 1928; flying around, May 16, 1929.

Baris striatus (Say) R. on grass and shrubs, July 12 to August 28; L. **Solidago rigida** September 10, 1928.

Endalus aeratus Lec., L. on grass, May 28, 1928.

Tychius sordidus Lec. H. on weed, April 23, 1929.

Elleschus ephippiatus (Say) L. on grass, May 17, 1928.

Onychobaris sp. R. on grass, August 18, 1928.

Trichobaris trinotata (Say) H. on grass, May 24, 1928.

Conotrachelus nivosus Lec. H. on grass, May 17, 1928.

Rhodabaenus tradecempunctatus (Ill.) L. on **Solidago rigida**, September 10, 1928.

OBSERVATIONS ON THE EFFECTIVENESS OF SOME MOTH-PROOFING CHEMICAL COMPOUNDS (1)

D. RONALD MUSSER (2)
Atwood, Kansas.

The object of this investigation was to determine the insecticidal value of various moth-proofing chemical compounds, most of which are now used in some form or another against insects injurious to fabrics.

The work was stimulated by the increasing attention given to these insects throughout the world, and by the fact that the application of moth-proofing compounds to infested fabrics is a relatively new commercial process or household practice and is of growing interest not only to textile and furniture manufacturers, but also to the general public.

Review of Literature

Of the numerous moth-proofing solutions now available, the most effective are fluoride, cinchona alkaloid, Eulan, Konate and Rotenone solutions. Mixtures containing arsenic in any form are not advocated since the use of arsenic in this manner has not been approved by the American Medical Association (1923). In addition, several cases have been reported where the application of an arsenical moth-proofing preparation to a fabric has resulted in an irritation of the skin.

In the experiments conducted by Jackson and Wassel (1927) they found that the conchona alkaloids or their compounds in either water or petroleum naphtha solutions are commercially suitable for treating materials by immersion.

Minaeff and Wright (1929), in tests made in the laboratories of the Larvex Corporation, have shown that a group of chemicals consisting of different inorganic fluorine compounds are most effective. Sodium silicofluoride was found more effective than sodium fluoride even when the latter was applied in solutions of double concentration. Samples treated with sodium silicofluorides resisted rinsing in water much better than those treated with sodium fluoride. The experiments conducted by Moore (1930) showed that larvae feeding upon

(1) Contribution No. 426 from the Department of Entomology.
(2) The writer is indebted to Dr. Roger C. Smith of Kansas State College for his valuable suggestions and criticism in the direction of this investigation.

cloth treated with a silicofluoride or with a preparation containing arsenic will die, usually before they have sufficient time to cause appreciable damage.

White (1929) made tests with Eulan F Extra and Eulan A and both proved to be satisfactory moth-proofing solutions. Back and Cotton (1929) stated that laboratory experiments of the United States Department of Agriculture have indicated that no usable solution is now on the market that will "permanently and absolutely render treated fabrics moth-proof". However, it is equally true that some of the better solutions, if properly used, do impart a moth resistance to fabrics that is of real practical value. The effectiveness or ineffectiveness of a moth-proofing solution depends much on the manner and thoroughness of application. Back (1931) recommended a combination of fumigation and moth-proofing services as a means of preventing reinfestations after fumigation.

Materials and Methods

The insects used in the tests consisted of five species of the more common fabric pests. Two species of clothes moths, the case-making and the webbing; and three species of carpet beetles, the black, common, and varied were used.

In all of the tests, the material treated consisted of small pieces of woolen blankets of the finished type, which had not been treated previously with any moth-proofing compound. The finished blanket pieces had a fairly heavy, soft nap on both sides, while those of the unfinished blankets had no nap.

The pieces of woolen blankets used in the experiments were cut into rectangular samples 4 inches long and 2 inches wide. After treating and drying these samples, they were folded lengthwise, five active larvae of the same species confined within the fold of both finished and unfinished samples, and the three open sides closed by means of paper clips. In one corner of each treated sample was attached a tag giving the date, the kind of insect used, and the method of treatment. Each sample was then placed in a separate ice cream carton to prevent the escape of the larvae.

The various tests were continued over a period varying from 2 weeks to 3 months in length. From time to time, examinations of the samples were made and the number of larva alive or dead, any apparent feeding, and any other important information were recorded.

Efficiency Tests of Moth-Proofing Materials Using Five Larvae of the More Common Clothes Pests for a Period of Exposure Varying from Two Weeks to Three Months.

Moth-Proofing Materials	Method of Application	FINISHED FABRICS No. Larvae Surviving				
		Clothes Moths		Carpet Beetles		
		Case	Web	Black	Common	Varied
(1) Steuben Chemical Compound (hydrofluoric acid solution.)	Immersed	0 0 0	0 1 0	0		0
(1) Steuben Chemical Compound (hydrofluoric acid solution.)	Sprayed	0	0	0	0	0
(1) Steuben Chemical Compound (hydrofluoric acid solution.)	Immersed then dry-cleaned	1	0 2	0		0
(1) Steuben Chemical Compound (hydrofluoric acid solution.)	Immersed then Washed	3	0	1		0
(2) None (Check)	Untreated (Check)	5 3 1	0 2 2	3		3
(2) Sodium Fluoride (saturated solution in cold water.)	Immersed	1 0	0 0	0	0	0
(2) Sodium Fluoride (saturated solution in cold water.)	Sprayed	1 0 1		1 3		3 5
(2) None (Check)	Untreated (Check)	3 4	1 2	5 4	3	4 5
(3) Sodium Fluosilicate (saturated solution in cold water.)	Sprayed	1 3 0	0	0 0 3		

(Continued)

Moth-Proofing Materials	Method of Application	FINISHED FABRICS No. Larvae Surviving Clothes Moths Case	Web	Carpet Beetles Black	Common	Varied
(3) Sodium Fluosilicate (saturated solution in cold water.)	Sprayed	0 0 2		0 5	1	4 3
(3) Sodium Fluosilicate (saturated solution in cold water.)	Sprayed then dry-cleaned	0 1		2 0		
(3) Sodium Fluosilicate (saturated solution in cold water.)	Sprayed then washed	3 1		2 4		
None (Check)	Untreated (Check)	3 4	1 2	5 4	3	4 5
(4) Century Moth-Proofing (an arsenical preparation.)	Sprayed	1 0 0 0		1 0		5 1
(4) None (Check)	Untreated (Check)	4 5 2		5 4		5 3
(5) Larvex Moth-Proofing (a silicofluoride compound, the toxic material being sodium fluosilicate.	Sprayed	0 0 0		2 0		3 1
(5) None (Check)	Untreated (Check)	4 5 2		5 4		5 3
(6) Berlou Moth-Proofing Solution (an arsenical preparation.)	Sprayed	0 1 0 0		4 2		4 0

(Continued)

Moth-Proofing Materials	Method of Application	FINISHED FABRICS No. Larvae Surviving				
		Clothes Moths		Carpet Beetles		
		Case	Web	Black	Common	Varied
(6) None (Check)	Untreated (Check)	4 5 2		5 4		5 3
(7) Konate Moth-Proofing Solution (an oil of pyrethrum compound.)	Sprayed	1 0 1 2		0 2		0 3
(7) None (Check)	Untreated (Check)	4 5 2	5	5 4		5 3

Moth-Proofing Materials	Method of Application	UNFINISHED FABRICS No. Larvae Surviving				
		Clothes Moths		Carpet Beetles		
		Case	Web	Black	Common	Varied
(1) Steuben Chemical Compound (hydrofluoric acid solution.)	Immersed	0	0	0		
(1) Steuben Chemical Compound (hydrofluoric acid solution.)	Sprayed			0		
(1) Steuben Chemical Compound (hydrofluoric acid solution.)	Immersed then dry-cleaned	0		0	0	
(1) Steuben Chemical Compound (hydrofluoric acid solution.)	Immersed then washed	3		3		
(1) None (Check)	Untreated (Check)	0	1		0	0

(Continued)

Moth-Proofing Materials	Method of Application	UNFINISHED FABRICS No. Larvae Surviving Clothes Moths		Carpet Beetles		
		Case	Web	Black	Common	Varied
(2) Sodium Fluoride (saturated solution in cold water.)	Immersed		0	0		
(2) Same as above.	Sprayed					3
(2) None (Check)	Untreated (Check)	1	0	2	1	3
(3) Sodium Fluosilicate (saturated solution in cold water.)	Sprayed			0		0 0
(3) Same as above.	Sprayed			1		2
(3) Same as above.	Sprayed then dry-cleaned					0
(3) Same as above.	Sprayed then washed					4
(3) None (Check)	Untreated (Check)	1	0	2	1	3
(4) Century Moth-Proofing (an arsenical preparation.)	Sprayed			1		3
(4) None (Check)	Untreated (Check)			3		3
(5) Larvex Moth-Proofing (a silico-fluoride compound, the toxic material being sodium fluosilicate.	Sprayed	1		1		3
(5) None (Check)	Untreated (Check)			3		3
(6) Berlou Moth-Proofing Solution (an arsenical preparation.)	Sprayed			2		2
(6) None (Check)	Untreated (Check)			3		3
(7) Konate Moth-Proofing Solution (an oil of pyrethrum compound.)	Sprayed			1		0
(7) None (Check)	Untreated (Check)			3		3

The moth-proofing compounds which were used in the tests are given in the accompanying table and may be grouped into two classes. The first six compounds are toxic to the insects when ingested even in very small amounts, while the seventh compound acts as a repellant to the insects.

The moth-proofing solutions were either sprayed on the fabrics by means of a hand-operated atomizer, or the samples were completely immersed in the solution for a period of 10 minutes. The different methods of treatment of the samples are given in the table.

Explanation of Tests

The presence of live larvae after a considerable exposure to the treated fabrics was noted in several of the tests and may be explained in two ways. First, the carpet beetle larvae, especially those of the "varied carpet beetle", are known to be carnivorous and will devour their own kind. In this manner, one or two vigorous larvae could exist for several months. Second, the larvae of these fabric pests, especially those of the clothes moth, may pass into a period of dormancy or inactivity lasting as long as 8 to 24 months. During this period the larvae will neither feed nor move about appreciably. Later, however, they will become active, feed, and continue their growth.

No feeding occurred when the fabrics were immersed in the Steuben Chemical Compound using the recommended diluted solution of 1 to 9, 1 degree Baume. In the second test in which the fabrics were sprayed with this compound, a slight amount of feeding was noticed on only one sample.

When the fabrics were dry-cleaned after the application of the Steuben Compound, a slight amount of feeding was apparent on two samples. However, when the fabrics were thoroughly washed after being treated, feeding was more evident and occurred on three samples, two of the finished and one of the unfinished fabrics. In the dry-cleaning treatment, Stodard's solvent, a gasoline preparation, was used; while in the washing treatment, the fabrics were thoroughly washed in warm water using Crystal White laundry soap.

The number of dead larvae and the slight amount of feeding occurring in the check test gave sufficient evidence to indicate that these insects, in their natural habitat, feed very little during winter months.

Injury to the samples was observed in two tests with sodium fluoride. Two or three small holes were cut through two of the samples of finished fabrics which were sprayed with the solution. Very conclusive evidences of feeding were apparent on the untreated material used as a check. Ten out of the 14 samples used in the check test showed the results of larval feeding.

In all the tests using sodium fluosilicate, the solution was sprayed on the fabrics. The first test was continued over a period of 2 months, and the second test extended over a month and a half's time. No feeding occurred in either test, although a considerable number of larvae, especially those of the carpet beetles, were still alive in the first two tests after a fairly long exposure to the treated fabrics.

The results of the test in which the fabrics were dry-cleaned after being sprayed with sodium fluosilicate indicate that this compound adheres well to the fiber, and that the dry-cleaning treatment apparently does not affect adversely the moth-proofing properties of this compound. However, the thorough washing of the fabrics, after being treated in a similar manner, removed a sufficient portion of the compound from three samples so that larval feeding occurred.

Slight evidences of feeding were apparent on three samples of the finished fabrics on which the Century moth-proofing compound was applied, and on two samples which were sprayed with Berlou moth-proof. However, in each of the five samples on which feeding occurred, all the larvae were killed, thus showing the toxicity of this material on the fabrics.

The results recorded in those tests in which Larvex and Konate moth-proofing solutions were used, combined with the fact that no evidences of feeding were apparent in either of the tests, indicate that the application of these two compounds was effective in preventing the injury caused by these fabric pests.

Summary of Results

1. The results of the tests indicated that all of the compounds tests offered approximately complete protection to the treated fabrics against clothes moths and carpet beetles. In many cases, this protection either caused directly the death of the insects confined within

the treated samples or resulted in their starvation.

2. Dry-cleaning and washing removed a sufficient portion of the Steuben Chemical Compound and the sodium fluosilicate from the fabrics to permit the larvae to cause appreciable damage to them. Similar tests were not conducted with the other moth-proofing compounds used.

3. The results of the dry-cleaning and washing tests appear to indicate that guarantees or claims of protection for the life of the fabrics from clothes moths or carpet beetles upon one application of any particular moth-proofing compound are to be looked upon with suspicion.

4. Complete immersion of the fabrics gave slightly better protection than the application of the moth-proofing solution as a spray. The application of moth-proofing solutions by means of immersion or with the aid of a power-spraying machine is recommended.

5. Fabrics of the finished type were damaged in the checks to a greater extent than the fabrics of the unfinished type.

6. The toxic moth-proofing materials, which consist of the arsenical and fluorine compounds, usually killed the larvae of these clothes pests when feeding occurred.

7. Although the moth-proofing solutions which contain an arsenical compound are used very extensively at the present time by several moth-proofing concerns, these solutions should be applied with caution due to their toxic effects upon human beings.

8. Larvae of the clothes moths were killed more quickly by the moth-proofing compounds tested than were the larvae of the various species of carpet beetles, the latter being apparently more resistant to the toxic or repellent effects of these compounds.

9. From the results of the experiments, it appears that the general public could advantageously purchase sodium fluosilicate in bulk, prepare a saturated solution in distilled water, apply it thoroughly either by immersion or spraying, and obtain a high degree of success in the protection of clothing and carpets against these fabric pests.

10. The experimental work from which the data re-

corded in this paper were taken extended over practically one calendar year. While the tests were not so extensive as those conducted by other workers in this field, the results obtained compared favorably with their investigations, and gave rather definite indication concerning the insecticidal value of the various moth-proofing compounds tested.

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THE PRACTICAL USE OF THE SUN IN COWPEA WEEVIL CONTROL

R. R. REPPERT, Extension Entomologist
M. R. BENTLEY, Extension Agr. Engineer

Cowpeas of the variety known as blackeyed peas, are an important article of diet in Texas, but their storage for this purpose for any considerable time, especially during the warmer months, is a difficult matter because of the attack of weevils that may totally destroy them within a very few weeks. While economical methods are available for the effective control of these pests, they are not generally practiced.

During the summer of 1934, with grain crops cut short by the drouth and cotton production doubtful because of the same continuing condition, and with the cash funds of the rural population at a low level, it appeared important that a method requiring a minimum of equipment and easily applied by the small producer should be devised for the destruction of weevils so that the crop of peas produced in spite of the drouth might be saved for fall and winter food.

To lay the basis for recommendations, two shallow wooden trays with inside dimensions of 3½x28½x39½ were prepared. The floor of each was covered with galvanized sheet iron. For the purpose of comparing efficiency in treatment, one of these trays was provided with a covering of glass sash, while the other was left open, the low sides of this open tray serving the purpose only of maintaining the temperature of the mass of peas against fluctuation by air currents.

No blackeyed peas were at the time available; consequently the test was made using Chinese red cowpeas, susceptible to attack by the same weevil and indeed, already fairly well infested with weevils and with numerous eggs laid on the surface of the peas. These were dumped onto the trays, and leveled off to an even depth of ½ inch, the excess peas being removed.

Both pans were placed so the sun would strike them to best advantage. A dairy thermometer with bulb resting on the surface of the peas, was provided for each tray, and readings taken at intervals, while for comparison, readings were taken at the same intervals from a similar thermometer hung in a near-by tree. At intervals also, samples of peas were taken from each tray to de-

termine the effect of treatment for the different periods and at varying temperatures, on germination and also to determine the effect as to destruction of weevils.

The first test was made August 23, and repeated the next day, August 24. Both days were quiet, with very little wind. August 23 was almost absolutely clear, though toward the end of the afternoon, high, thin clouds slightly reduced the sun's intensity. August 24 was a bright day, with the sun's rays intense, but totally obstructed at intervals by floating clouds.

Table I indicates the thermometer readings at stated times in each tray, with corresponding temperature in the shade. The time at which each sample was taken is also indicated. The number given these samples in Table I will identify them in subsequent tables.

Basing our recommendations on the temperature readings secured in this test, and on our determination in tests two years previously of the temperature and time of exposure necessary for weevil control by the use of artificial heat, we issued to our farmer constituency a mimeographed circular (MS-248) from which the paragraphs below are quoted. With part of the crop harvested and in need of treatment, it was felt that these general recommendations should be made at once, without waiting for the results of germination tests or observations for the appearance of weevils.

"The suggested procedure in using this equipment is to set first the empty tray flat on the ground, place the thermometer in it, and cover it with glass. When, and if, the thermometer in it runs up to 150 degrees, the treatment of the peas may start. The cowpeas are poured in the tray, spread out about ½ inch deep and the thermometer set in them, and the glass cover placed over them. After the thermometer reaches 150 degrees, leave the cowpeas for about 10 or 15 minutes and then empty them in a weevil free container and recharge the tray with cowpeas, and repeat the process.

"Treated cowpeas should not be placed in gunny sacks or any other open mesh sacks, or they may be reinfested with weevils. Canvas sacks, metal cans, or barrels covered so as to not admit live weevils, will protect cowpeas against reinfestation after treatment.

"Temperatures in the treating trays above 180 degrees are apt to impair germination of the cowpeas; however, it is unlikely that a dangerously high temperature

will occur within 10 or 15 minutes after a temperature of 150 degrees is attained. Our test showed that it is much less difficult to get a certain desirable temperature by using a glass covered tray than by leaving the cowpeas uncovered in the sun. The temperature about the uncovered peas is affected by any breeze and by clouds over the sun for brief periods, so that it is difficult to obtain a weevil killing temperature over any certain required period of time."

Table I.

Temperature Data Secured on Chinese Red Cowpeas Treated in Sun

(Temperatures in degrees F.)

August 23, 1934, (sky clear)

Time, p. m.	Temperature (in shade)	Temperature in pan covered with glass	Temperature in open pan.
2:50	98	125 many weevils crawling	118 many weevils crawling
2:55	98	134 No weevils evident	122 many weevils crawling
3:00	99	140 No weevils evident	125 a few weevils crawling
3:05	98	145 sample No. 2 taken	125 a few weevils crawling
3:10	99	148	126 a few weevils crawling
3:15	99	150 sample No. 3 taken	126 a few weevils crawling
3:20	98	151	126 no weevils evident except in shade of side
3:25	98	151 sample No. 4 taken	124 sample No. 5 taken
3:35	99	151 sample No. 6 taken	127

3:45	100	151 sample No. 7 taken	127
3:55	97	146	118
4:05	97	143 sample No. 8 taken sample No. 103 taken	118 sample No. 9 taken live weevils present in shade of side sample No. 101 taken
		August 24, 1934	
11:00 a. m.	94	126	123
12:00 M.	96	178 sample No. 10 taken	132
1:00 p. m.	96	192 sample No. 11 taken	132 sample No. 12 taken
2:00 p. m.	98	194 sample No. 13 taken	145 sample No. 14 taken
3:00 p. m.	96	192 sample No. 15 taken	133 sample No. 16 taken
4:00 p. m.	98	168 sample No. 104 taken	130 sample No. 102 taken

On August 25, 50 seeds from each lot taken were planted in open garden soil for a germination test. A duplicate series, with the same number of seeds, was planted the same day. The resulting plants were dug and counted on August 30, and the germination percentage recorded.

The remainder of each sample was placed in glass jars, with covers applied to exclude adult weevils, yet slightly loose so as not to be air tight, and held to determine if weevils should develop.

In Table II is indicated the effect of varying treatment upon germination as well as efficiency in weevil control. For convenience and ready reference, the time of exposure and the range of temperature to which exposed is indicated for each lot. For an understanding of just how the temperature varied within these limits at intervals during the time of exposure, reference must be made to the data of Table I.

TABLE II

Showing Time of Exposure, Range of Temperature, Percentage of Germination, & Effect of Weevil Infestation of Sun Treatment of Cowpeas

Lot No.	Date Treated	Exposure (Min.)	Temp. range (degrees)	Open or covered	Condition of sample on date as indicated		Aug., 1934 % Germination
					Dec. 22, 1934.	March 19, 1935	
1	8/23	Check	Check	Check	Severe weevil development, peas otherwise sound; numerous live weevils.	Severe weevil development, peas badly molded & decayed. Weevils dead	83
2	8/23	15	125-145	covered	No weevil development, peas sound.	No weevil development, peas sound.	81
3	8/23	25	125-150	covered	No weevil development, peas sound.	No weevil development, peas sound.	77
4	8/23	35	125-151	covered	No weevil development, peas sound.	No weevil development, peas sound.	82
5	8/23	35	118-126	Open	Severe weevil development, peas badly molded & decayed, weevils dead.	Severe weevil development, peas badly molded & decayed. weevils dead.	73
6	8/23	45	125-151	covered	No weevil development, peas sound.	No weevil development, peas sound.	85
7	8/23	55	125-151	covered	No weevil development, peas sound.	No weevil development, peas sound.	86
8	8/23	75	125-151	covered	No weevil development, peas sound.	No weevil development, peas sound.	79

TABLE II (continued)
Showing Time of Exposure, Range of Temperature, Percentage of Germination, & Effect of Weevil Infestation of Sun Treatment of Cowpeas

Lot No.	Date Treated	Exposure (Min.)	Temp. range (degrees)	Open or covered	Condition of sample on date as indicated Dec. 22, 1934.	March 19, 1935	Aug., 1934 % Germination
9	8/23	75	118-127	open	No weevil development, peas sound.	No weevil development, peas sound.	79
10	8/24	60	125-178	covered	No weevil development, peas sound.	No weevil development, peas sound.	75
11	8/24	120	126-192	covered	No weevil development, peas sound.	No weevil development, peas sound.	65
12	8/24	120	123-132	open	No weevil development, peas sound.	No weevil development, peas sound.	78
13	8/24	180	126-194	covered	No weevil development, peas sound.	No weevil development, peas sound.	39
14	8/24	180	123-145	open	No weevil development, peas sound.	No weevil development, peas sound.	74
15	8/24	240	126-194	covered	No weevil development, peas sound.	No weevil development, peas sound.	52
16	8/24	240	123-145	open	No weevil development, peas sound.	No weevil development, peas sound.	76
17	8/24	300	123-145	open	No weevil development, peas sound.	No weevil development, peas sound.	72

It is interesting to note that the percentage germination of lots 14, 16, and 17 was 74, 76, and 72 respectively, as compared with 83% for lot 1, untreated. Lot 14 was exposed three hours, lot 16 four hours, and lot 17 five hours, at a temperature ranging from 123 to 145 degrees in each case. This would indicate that prolonged exposure of uncovered cow peas to the sun on a normal summer day in central Texas is not seriously injurious to their viability.

Lot 15 received the severest treatment of all the samples germinated, namely four hours at temperatures ranging from 126 to 194 degrees, with two hours at 192 degrees and above, recorded a germination percentage of 52. While this indicated rather serious injury to the seed, it was much less than had been anticipated.

At this time a further test that had not been earlier planned, to determine the effect of severe treatment of seeds upon the vigor of resulting plants, was conceived. It was our opinion, as had also appeared to be the opinion of others, that long exposure at high temperatures as severe as that indicated in Table II, would not only greatly reduce the percentage of germination, but would result in weak plants. The data obtained, while open to some criticism in that the test was not repeated a sufficient number of times to permit absolutely definite conclusions, yet indicate that this theory may have been much too tenaceously held.

When this test was conceived, there were no longer available any untreated peas for use as a check. The four lots of peas, remaining at the end of treatment on the two days and exposed in the two different ways, however, had been kept separate. The results secured from these four lots present some very interesting data.

The amount of material in each lot and the circumstances did not permit a repetition of plantings under conditions to make the results conclusive, and here again the data can be considered only as indicative.

Each lot was drilled in one continuous row with common garden planter, the rate of seeding and the depth of planting being the same for all lots. Lot No. 1 was drilled along the ridge of a 12 foot bed, that sloped each way to a ditch, the ditch and ridge being 6 feet apart from center to center. Lot 2, 4, and 3 followed in the order given, at 18 inch intervals. Lot 3 was the last and

closest to the ditch. It would be hard to interpret the relative effect of soil and moisture conditions upon the different lots. Moisture conditions should not be considered an important factor however, since the test began in the midst of a protracted drouth and continued with only slight showers at intervals, none of which was sufficient to cause the water to run or collect and which sank into the surface soil directly where it fell.

After the plants were up, a rod length was measured off (designated Plot 1) where appearances of plants in all rows indicated the drill planted evenly with no bunching of seed due to trash or other causes, and the growing plants in each row counted. The results were so different from what was expected that another representative rod length (designated as Plot 2) was selected further along the row and the counts repeated. The data, with such comments as are considered significant, are contained in Table III.

In making the periodic counts, it was hardly possible under existing conditions and no attempt was made to determine how many plants had actually died during the interim, and how many had newly sprouted. The rule was followed of counting all plants showing above the soil surface, continuing to count all plants even though the leaves had fallen, or were withered, as long as the stalk itself remained green and succulent. The foregoing fact, together with light showers that occurred at intervals, accounts for a greater number of plants occasionally recorded for certain lots at one period than was recorded the period previous.

TABLE III.

Showing Effect of Varying Severity of Sun Treatment of Cowpeas on Vitality of Resulting Plants during Later Growth

Date of Observation.	Lot No.*	Plot 1 No. Plants Growing	Plot 1 % living based on number growing Sept. 23	Plot 2 No. Plants Growing	Plot 2 % living based on number growing Sept. 23	Total of Plots 1 & 2 No. Plants Growing	Total of Plots 1 & 2 % living based on number growing Sept. 23	Remarks:
1934								
Sept. 15	101							Planted this date
	102							Planted this date
	103							Planted this date
	104							Planted this date
Sept. 19	101							No counts made on this date. All rows up well except No. 4 appeared 1 day behind.
	102							
	103							
	104							
Sept. 23	101	183	100	151	100	334	100	No apparent difference in growth of rows.
	102	133	100	137	100	270	100	
	103	135	100	140	100	275	100	
	104	132	100	110	100	242	100	
Sept. 30	101	166	90.7	142	94.0	308	92.2	Row 4 showed slightly less growth than other 3 rows.
	102	127	95.5	133	97.1	260	96.3	
	103	129	95.6	133	95.0	262	95.3	
	104	131	99.2	108	98.2	239	98.8	

*(See foot note at end of table) (continued)

TABLE III (continued)

Date of Observation.	Lot No.	Plot 1 No. Plants Growing	Plot 1 % living based on number growing Sept. 23	Plot 2 No. Plants Growing	Plot 2 % living based on number growing Sept. 23	Total of Plots 1 & 2 No. Plants Growing	Total of Plots 1 & 2 % living based on number growing Sept. 23	Remarks:
Oct. 7	101	153	83.6	129	85.4	282	84.4	No apparent difference in growth of rows.
	102	117	88.0	131	95.6	248	91.9	
	103	124	91.9	127	90.7	251	91.3	
	104	126	95.5	105	95.5	231	95.5	
Oct. 14	101	145	79.2	130	86.1	275	82.3	Slight shower since Oct. 7 & other seed germinated. No apparent difference in growth of rows.
	102	112	84.2	137	100	249	92.2	
	103	118	87.4	127	90.7	245	89.1	
	104	129	97.7	102	92.7	231	95.5	
Oct. 20	101	139	76.0	127	84.1	266	79.6	No apparent difference in growth of rows.
	102	110	82.7	134	97.8	244	90.4	
	103	117	86.7	126	90.0	243	88.4	
	104	127	96.2	97	88.2	224	92.6	
Oct. 28	101	138	75.4	125	82.8	263	78.7	
	102	110	82.7	133	97.1	243	90.0	
	103	117	86.7	125	89.3	242	88.0	
	104	125	94.7	97	88.2	222	91.7	
Nov. 5	101	137	74.9	123	81.5	260	77.8	
	102	107	80.5	128	93.4	235	87.0	
	103	115	85.2	125	89.3	240	87.3	
	104	120	90.9	95	86.4	215	88.8	

(continued)

TABLE III (continued)

Date of Observation.	Lot No.	Plot 1 No. Plants Growing	Plot 1 % living based on number growing Sept. 23	Plot 2 No. Plants Growing	Plot 2 % living based on number growing Sept. 23	Total of Plots 1 & 2 No. Plants Growing	Total of Plots 1 & 2 % living based on number growing Sept. 23	Remarks:
Nov. 18	101	135	73.8	123	81.5	258	77.2	
	102	105	78.9	125	91.2	230	85.2	
	103	113	83.7	121	86.4	234	85.1	
	104	119	90.2	95	86.4	214	88.4	
Nov. 23	101	134	73.2	122	80.8	256	76.6	Frost threatened & all plants pulled for weighing on this date.
	102	106	79.7	126	92.0	232	85.9	
	103	113	83.7	122	87.1	235	85.5	
	104	118	89.4	95	86.4	213	88.0	

*Lot 101 was subjected to a temperature range of 118-127 degrees F. for 75 minutes.
Lot 102 was subjected to a temperature range of 123-145 degrees F. for 300 minutes.
Lot 103 was subjected to a temperature range of 125-151 degrees F. for 75 minutes.
Lot 104 was subjected to a temperature range of 126-194 degrees F. for 300 minutes.

The table indicates the percentage of plants of each lot living on successive dates, based on the number which had germinated on September 23, eight days after planting. A very interesting thing is that in the case of Lot 104, receiving the severest treatment, the percentage living on successive dates and on the final date of observation, was noticeably greater than in the case of lot 101, receiving the mildest treatment. Corresponding percentages in the case of lots 102 and 103, with intermediate treatments, run so consistently between these other two as extremes, as to be significantly suggestive. Other than the thought that higher temperature may have been destructive of surface organisms that might otherwise be injurious to the growing plants, no interpretation of this unexpected outcome will be attempted.

The evening of November 23 a frost threatened, and all plants were pulled, the dirt carefully shaken from the roots, and all plants from each row with the roots were wrapped in coarse paper, to minimize loss of weight by evaporation, and the next day these lots were separately weighed. The weights were recorded for each lot and the corresponding weight per plant of each lot computed. The resulting data are set forth in Table IV.

In this table it is shown that although lot 104 received the severe treatment, and had the lower percentage germination, it finally produced on an equivalent area a considerable greater total plant mass than did lot 101, and of course, a much greater weight per plant. So many factors might be argued as actually favoring such final results, that no conclusion will here be drawn and the data are presented only as interesting and worthy of checking through further research.

This work was inaugurated not in the nature of a well planned experiment, but to determine so far as possible data practical for the farmers to apply for the immediate preservation of their crop of peas from weevil attack. It was carried out under the limitations, so far as time for painstaking observation is concerned, under which Extension workers must necessarily operate. The data are not presented as absolutely conclusive, but as indicative and provocative of further research.

TABLE IV.

Indicating Final Relative Weight of Measured Rows of Plants from Sun Treated peas, subjected to exposure of Varying Severity, with Calculated Weight per Plant.

	Plot 1			Plot 2			Total of Plots 1 & 2		
Lot No.*	No. Plants Growing	Total weight (ounces)	Average weight (ozs.)	No. Plants Growing	Total weight (ozs.)	Average weight (ozs.)	No. Plants Growing	Total weight (ozs.)	Average weight (ozs.)
101	134	46	.343	122	71	.582	256	117	.457
102	106	47	.443	126	57	.452	232	104	.448
103	113	66	.584	122	89	.730	235	155	.660
104	118	63	.534	95	64	.674	213	127	.596

Evidently because of better fertility, all growth in plot 2 much stronger than in plot 1.

*Lot 101 was exposed August 23 in open pan for 75 minutes at a temperature range of 118-127 degrees.

Lot 102 was exposed August 24 in open pan for 300 minutes at a temperature range of 123-145 degrees.

Lot 103 was exposed August 23 in glass covered pan for 75 minutes at a temperature range of 125-151 degrees.

Lot 104 was exposed August 24 in glass covered pan for 300 minutes at a temperature range of 126-194 degrees.

The following conclusions are drawn.

1. That exposure of cowpeas to the open sunlight on a clear day with no wind blowing between the hours of 10 a. m. and 4 p. m. when shade temperatures are 98 degrees or more, for a period of 75 minutes or more, will result in the complete destruction of all stages of weevils that may be infesting them.

2. Exposure of cowpeas under the same conditions noted in No. 1, but covered with glass, for a period of 15 minutes, will result in the complete destruction of all stages of weevils that may be infesting them.

3. Exposure of cowpeas, under the conditions noted in No. 1, continued for as much as five hours, is not seriously injurious to germination, provided the shade temperature is not greater than 100 degrees.

4. Exposure of cowpeas, under the conditions noted in No. 2, continued for as much as one hour, is not seriously injurious to germination, provided the shade temperature is not greater than 96 degrees.

5. Exposure of cowpeas, under the conditions noted in No. 4, continued for as much as five hours, while it reduces germination percentage considerably, does not apparently reduce the vigor of the resulting plants. Although the initial number of plants, because of reduced germination percentage, may be smaller over a given planted area, a greater percentage of these persist in growth and the final total weighted production and average weight per plant is greater than in the case of peas receiving the milder treatments noted.

ACKNOWLEDGEMENT

Appreciation is here expressed to Dr. F. L. Thomas, Entomologist of the Texas Agricultural Experiment Station, College Station, Texas, in reviewing the text of this article.

MINUTES OF THE TWELFTH ANNUAL MEETING OF THE KANSAS ENTOMOLOGICAL SOCIETY.

Kansas State Teachers College — Emporia, Kansas.
April 4, 1936.

Business Meeting

President Kathleen Doering called the meeting to order at 10:20 a. m. in room 104, Science Hall.

The minutes of the eleventh annual meeting were read and approved.

Reports of Officers.

The secretary reported that the Society has 130 subscriptions to Vol. 9 (the current volume) on Apr. 3, 1936 The subscribers are distributed in England, Canada, Italy, Germany, Peru, Philipine Islands, China and the United States.

The treasurer's report was read and approved as follows: The Society had as assets in a time deposit, $407.00; in the checking account of the treasurer, $233.35; accounts receivable, $53.61 and that all bills against the Society were paid to date.

The editor was not present and did not make a report.

Reports of Standing Committees.

Wild Life. No report.

Appointment of Committees.

Nominations Committee.

Roger C. Smith, Chairman
R. H. Beamer — H. R. Bryson

Resolutions Committee

H. B. Hungerford, Chairman
Don B. Whelan — D. A. Wilbur

Old Business. None

New Business.

The Secretary discussed the duties of the Executive Committee showing a need for additional duties necessary to conduct the business of the Society. H. B. Hungerford made a motion that the President appoint a committee to draw up an amendment to the constitution defining the duties of the Executive Committee. Motion carried. President Doering appointed the following committee: R. H. Painter, Chairman
L. C. Woodruff
R. L. Parker

W. Knaus, publisher, reported that No. 2 of Vol. 9 contained the program of this meeting and that the Jour-

nal is being sent to 7 foreign countries.

An announcement was made that the meeting of the North Central States Entomological Conference for 1937 would be held in Kansas City, Missouri, the first week in March, 1937.

Following the business meeting the first five papers listed on the program as printed on page 72, Vol. 9, were presented. The Society adjourned for lunch at 11:55 a. m. and reconvened at 1:50 p. m. at which time the remainder of the 19 papers were presented. Following the program of papers a motion picture of termite injury to buildings was shown.

Final Business.

Reports of Committees.

The special committee on amending the constitution presented the following amendment for consideration.

That the Kansas Entomological Society amend the section of the constitution of this Society concerning the duties of the Executive Committee as follows:

1. The Editor of the Journal of the Kansas Entomological Society shall be an ex-officio member of the Executive Committee.

2. Additional duties of the Executive Committee shall be: (a) To carry out all business transactions, other than those of the treasurer in conducting the business of publishing the Journal, during the interum between annual meetings; (b) To formulate policies of the Society.

3. Business transactions and changes in policies are to be reported at the next annual meeting of the Society for ratification.

(Signed) R. H. Painter
L. C. Woodruff
R. L. Parker

R. H. Painter made a motion the amendment be adopted.

H. R. Bryson amended the motion that the constitutional amendment be voted upon as a whole. The motion was carried and so adopted.

Resolutions Committee

Be it resolved: (1) That the Kansas Entomological Society express its appreciation to the officers of the Kansas Academy of Science and its local committee for the excellent accomodations and arrangements made

available to our Society.

(2) That we express our gratitude to the editor, the secretary-treasurer, and the publisher of tl e Journal of the Kansas Entomological Society for their efforts in behalf of our publication.

(3) That we make every effort to have a full representation of the Society at the meeting of the North Central States Entomological Society Conference next March, at Kansas City, Missouri.

(4) That the Kansas Entomological Society favors the establishment of a state park to include the unusual rock formation near Minneapolis, Kansas, and that the Society through its officers cooperate with Dr. W. N. Schoewe, Chairman of the "Committee on Natural Areas" of the Kansas Academy of Science.

(Signed) H. B. Hungerford
D. A. Wilbur
Don. B. Whelan

Report adopted.

Auditing Committee

These accounts have been audited this 4th day of April, 1936, and found to be in order.

(Signed) H. H. Schwardt
R. H. Beamer

Nominations Committee.

President—D. A. Wilbur
Vice-President—L. C. Woodruff
Secretary-Treasurer—R. L. Parker

We recommend that the secretary-treasurer pay no dues, in appreciation of his work for the Society.

(Signed) Roger C. Smith
R. H. Beamer
H. R. Bryson

H. R. Bryson made the motion that the report be adopted. Carried.

Past President Kathleen Doering called President D. A. Wilbur to preside and since there was no unfinished business adjournment was in order.

Adjournment at 5:30 p. m.

There were 60 members and friends present from Fayetteville, Arkansas; Lincoln, Nebraska; Kansas City, Missouri; Lawrence, Topeka, Manhattan, Wichita, Fort Scott, McPherson and Emporia, Kansas.

R. L. Parker, Secretary.

CORRECTIONS

In my recent paper on the Stratiomyidae of Colorado and Utah (Jour. Kans. Ent. Soc., 9:33-48), there are two errors which I wish to correct. On page 34, couplet 4 of the key, "r-m", "R3", and "M1" should read "m-cu", "M3", and "Cu1". This is my error, not Mr. Hardy's, as this couplet was not included in this form in his key. On page 44, **"Odontomyia similis** Johnson" and its record should be deleted; this is a synonym of **"Labostigmina similis** Johnson", page 35.

Maurice T. James.

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